## REMARKS/ARGUMENT

Applicant responds herein to the Office Action dated September 16, 2002. A Petition for Extension of Time (one month) and the fee therefor are enclosed.

Claims 2, 4, 6, 8, 13-16, 18, 20, 22, 24 and 29-32 have been canceled.

The Examiner has objected to claims 10-12, 14-16, 26-28 and 30-32 under 37 CFR 1.75(c). Reconsideration is requested in view of the following remarks.

Candidly, the applicant's undersigned representative is not certain that he understands the objection. For example, claim 10 specifies that the ultraviolet light emitted from the ultraviolet emitter of claim 9 has a wavelength in the range of 242.4 to 300nm. That is a classic structural limitation on the recited structure. It structurally defines the emitter. Similarly, claim 11 recites that the cleaning solution has or includes a base solution. Again, this claim is quintessentially structural in nature. Similar remarks apply to the remaining claims. It is believed that the claims are in proper form.

Responsive to the rejection of claims 9-12, 25-28 and 29-32 under 35 U.S.C. §112, second paragraph, on the basis that is set forth in the third paragraph of the Office Action, the applicant has amended the claims in a manner which is responsive to the comments in the Office Action. Reconsideration and withdrawal of the rejection is requested.

Substantively, claims 1-8, 9, 11, 13, 15, 17-25, 27, 29 and 31 stand rejected on grounds of anticipation by Matthews (5,464,480). Claims 10, 12, 14, 16, 26, 28, 30 and 32 stand rejected on grounds of obviousness over the aforementioned Matthews document, further in view of Matsuo, et al. (6,403,498). Reconsideration of the aforementioned rejections on art is requested in view of the amendments to the claims herein and the following remarks.

In each of the remaining independent claims in the application, namely claims 1, 9, 17 and 25, it is essentially recited that the methodology or apparatus for either treating or cleaning a substrate is carried out by supplying a cleaning solution to the substrate following the two steps indicated below in order.

First, a cleaning solution which has already ozone dissolved therein, is supplied to the substrate. Thereafter, the cleaning solution on the substrate is irradiated with ultraviolet light.

The benefits of the invention are discussed at great length in the instant specification. Briefly, oxygen radicals are generated by the apparatus/method of the invention quite easily by irradiating the cleaning solution which has the ozone dissolved therein with ultraviolet light. The oxygen radicals react with water to generate OH radicals, thereby increasing the activity of the cleaning solution. Since the cleaning solution supplied to the substrate is irradiated with ultraviolet light, OH radicals may be generated adjacent the substrate surface being cleaned, to perform the cleaning treatment efficiently.

Thus, a significantly improved cleaning capability is achieved, even with low concentration ozone water. This method is also applicable to a piecemeal or single-substrate process for treating large substrates. Since the cleaning solution supplied to the substrate contains ozone in a low concentration, the filter and piping materials for supplying the cleaning solution need not have strong ozone resistance.

The Office Action contends that independent claims 1, 9, 17 and 25 are anticipated by Matthews, on the basis set forth in paragraphs 4-8 of the Office Action. It is worth noting that the Examiner comments (in paragraph 4 of the Office Action), "...the sequence of steps is not specified. Thus, no limitation regarding a step sequence will be assumed."

In the first instance, the applicant would take issue with the Examiner's above-noted observation. The doctrine of "claim differentiation" effectively requires assuming that the steps are in the order indicated. This follows from a comparison of claim 1 to canceled claim 2, the latter specifying that the water is irradiated and then applied to the substrate. But regardless, the claims now positively recite a specific sequence.

Turning to the allegedly anticipatory reference, Matthews, et al., the same discloses a technique for oxidizing an organic substance into an insoluable gas by causing the ionized water to absorb ozone water, and irradiating ozone with ultraviolet light to form oxygen molecules at the time of blowing.

The instant independent claims do not call for a process that has ozone water mixed with de-ionized water. Rather, the invention dissolves ozone in the de-ionized water.

Indeed, with reference to Matthews, it is an accepted view that ozone water does not dissolve completely in water, and commercially supplied ozone water also is not fully dissolved in a strict sense. That is, since, generally, ozone is forcibly dissolved in water, ozone comes out

of the water if left to stand. For example, in a pipe through which ozone water flows, ozone comes out of the ozone water in bubbles. As one way of coping with such problem, Matthews, et al. employs the technique of lowering the water temperature.

In the present invention, the operation of the apparatus is carried out in an ordinary environment. Thus, ozone water, once exposed to ambient air, is used immediately according to purpose. This is because ozone is quick in reaction, and also needs to be heated in order to increase the rate of reaction.

On the other hand, oxygen generated from the decomposition reaction of ozone in ozone water is itself stable and tends to leave the water as it is.

Further, OH radicals with one electron lacking are generated from the reaction of oxygen with water. These OH radicals are unstable and tend to return to the water.

In order to obtain a cleaning effect from a cleaning method using ozone water based on these phenomena relating to ozone, it is ideal to clean the substrate by irradiating the cleaning solution containing ozone water with ultraviolet light near the substrate as soon as the solution is applied to the substrate. This is embodied in the present invention, which provides the step of supplying the cleaning solution having ozone dissolved therein to the substrate and the immediately following step of irradiating the cleaning solution supplied to the substrate with ultraviolet light. In that combination, the process steps and the apparatus for carrying them out according to the invention are unique and novel, vis-à-vis the prior art.

Even if ozone water is jetted to a liquid, as in Matthews, et al., ozone does not dissolve easily under the low pressure condition, as specified in that reference (i.e., not necessarily dissolved in view of the facts noted above). It is therefore inappropriate for reducing cleaning time.

Furthermore, the source of ultraviolet light in Matthews, et al. is not directed to a substrate surface which is a principal object to be cleaned. It is therefore unclear that oxygen is generated efficiently by ultraviolet light in the part of the substrate to be cleaned. In other words, the primary concern of Matthews, et al. is irradiation of ozone with ultraviolet light.

On the other hand, the present invention takes the rate of reaction of ozone into account, and directs ultraviolet light to the substrate to which the cleaning solution has been already

supplied. In this point, the present invention is markedly different from Matthews, et al. Thus, the OH radicals generated may serve the cleaning purpose efficiently.

Based on the foregoing remarks, it is respectfully submitted that none of the independent claims in the application are anticipated by Matthews, et al.

The remaining dependent claims in the application incorporate the limitations of their base claims and impose further limitations which distance them even further from the prior art.

Although the Examiner cited a secondary reference, Matsuo, et al., it is clear that it was cited specifically for its alleged teaching of a UV light source having a wavelength between 242.4 and 300nm. Indeed, the Examiner contends that wavelength range is inherent in Matthews. Presumably, ultraviolet sources in all available spectrum ranges are described in one or another prior art document. However, the applicability of a secondary reference to the instant inventions, cannot be discussed without appropriately considering the overall context of the secondary reference. Of significance is that Matsuo, et al. discloses a dry-type cleaning apparatus for UV-irradiated ozone cleaning, as opposed to the wet process of the present invention. As such, it is not directly applicable to the instant invention. Regardless, the patentability of the dependent claims is already indicated on the basis of their incorporation of the limitations of their independent, base claims.

It is noted in passing that certain claims have been amended to avoid the usage of means plus function claim format.

Accordingly, it is submitted that all the remaining, pending claims in the application distinguish over the prior art. The Examiner is therefore respectfully requested to reconsider the application, allow the claims as amended, and pass this case to issue.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Asst. Commissioner for Patents, Washington, D.C. 20231, on January 15, 2003:

Max Moskowitz
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Signature

January 15, 2003
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Respectfully submitted,

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